

Hi-Fi Component

2-BAND (AM-FM STEREO) TUNER





CAUTION

**RISK OF ELECTRIC SHOCK
DO NOT OPEN**



**CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK). NO USER SERVICE-
ABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED
SERVICE PERSONNEL.**



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

**WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS
APPLIANCE TO RAIN OR MOISTURE.**

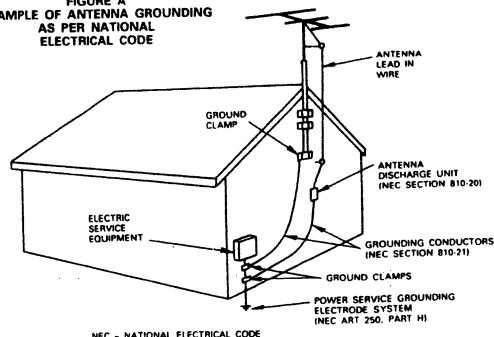
SAFETY INSTRUCTIONS

1. Read Instructions – All the safety and operating instructions should be read before the appliance is operated.
2. Retain Instructions – The safety and operating instructions should be retained for future reference.
3. Heed Warnings – All warnings on the appliance and in the operating instructions should be adhered to.
4. Follow Instructions – All operating and use instructions should be followed.
5. Water and Moisture – The appliance should not be used near water – for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, and the like.
6. Carts and Stands – The appliance should be used only with a cart or stand that is recommended by the manufacturer.
- 6A. An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.
7. Wall or Ceiling Mounting – The appliance should be mounted to a wall or ceiling only as recommended by the manufacturer.
8. Ventilation – The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
9. Heat – The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.
10. Power Sources – The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
11. Grounding or Polarization – Precautions should be taken so that the grounding or polarization means of an appliance is not defeated.
12. Power-Cord Protection – Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
14. Cleaning – The appliance should be cleaned only as recommended by the manufacturer.
15. Power Lines – An outdoor antenna should be located away from power lines.

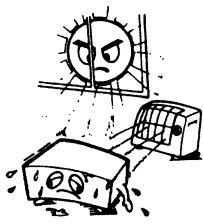

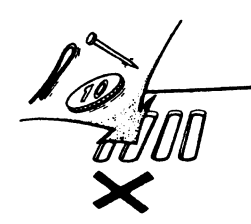
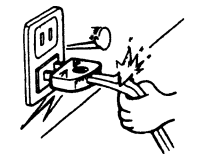
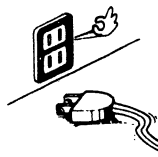
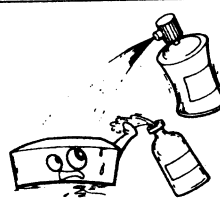
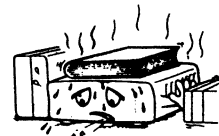



16. **Outdoor Antenna Grounding** – If an outside antenna is connected to the receiver, be sure the antenna system is grounded so as to provide some protection against voltage surges and built-up static charges. Article 810 of the National Electrical Code, ANSI/NFPA 70, provides information with regard to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna-discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode. See Figure A.
17. **Nonuse Periods** – The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
18. **Object and Liquid Entry** – Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
19. **Damage Requiring Service** – The appliance should be serviced by qualified service personnel when:
- The power-supply cord or the plug has been damaged; or
 - Objects have fallen, or liquid has been spilled into the appliance; or
 - The appliance has been exposed to rain; or
 - The appliance does not appear to operate normally or exhibits a marked change in performance; or
 - The appliance has been dropped, or the enclosure damaged.
20. **Servicing** – The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

FIGURE A
EXAMPLE OF ANTENNA GROUNDING
AS PER NATIONAL
ELECTRICAL CODE



NOTE ON USE

 <ul style="list-style-type: none"> Avoid high temperatures Allow for sufficient heat dispersion when installed on a rack. 	 <ul style="list-style-type: none"> Keep the set free from moisture, water, and dust. 	 <ul style="list-style-type: none"> Do not let foreign objects in the set.
 <ul style="list-style-type: none"> Handle the power cord carefully. Hold the plug when unplugging the cord. 	 <ul style="list-style-type: none"> Unplug the power cord when not using the set for long periods of time. 	 <ul style="list-style-type: none"> Do not let insecticides, benzene, and thinner come in contact with the set.
	 <p>*(For sets with ventilation holes)</p> <ul style="list-style-type: none"> Do not obstruct the ventilation holes. 	 <ul style="list-style-type: none"> Never disassemble or modify the set in any way.

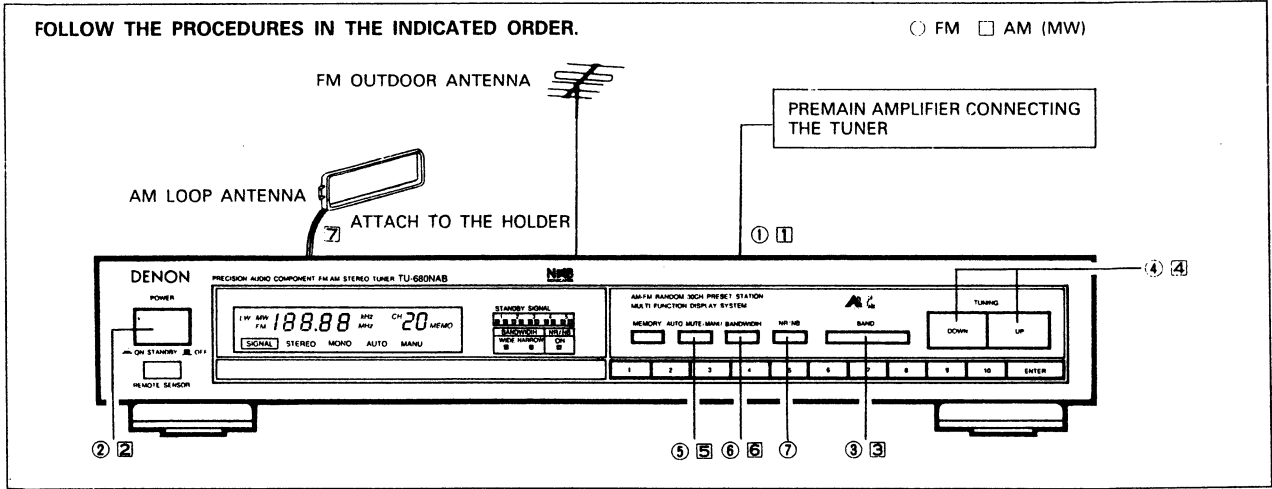
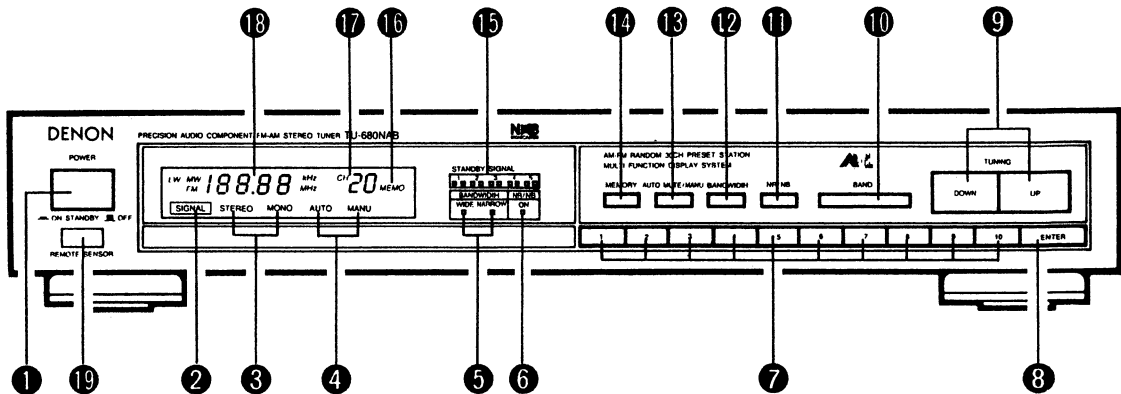
CAUTION

TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

Please check to make sure the following items are included with the main unit in the carton:

- ① Operating Instructions 1
- ② Audio 2-Pin plug cord 1
- ③ FM Indoor Antenna 1
- ④ AM Loop Antenna 1
- ⑤ Remote Control unit RC-126 1
- ⑥ R03 ("AAA") Dry cell batteries 2

FRONT PANEL



CAUTION

- 1. Noise may be generated if a near-by television set is on during AM broadcasting reception. The tuner should be used as far away from a television as possible.
- 2. Effective period of memory back-up is about a month under normal temperature. If the memorized stations cannot be called back, preset the stations again.

DESIGNATIONS AND FUNCTIONS OF PANEL CONTROLS

- 1 POWER (Power ON-STANDBY/OFF Switch)**
The unit works 2 to 3 seconds after this switch is turned on.
- 2 SIGNAL (Signal Indicator)**
This lights when a station can be received.
- 3 STEREO/MONO (Stereo/Mono Indicator)**
"STEREO" lights automatically when receiving a stereo broadcast.
"MONO" lights when receiving a monaural broadcast or no broadcast at all.
- 4 TUNING MODE (AUTO/MANUAL)**
Pressing MODE **16** causes "AUTO" and "MANUAL" to light up alternately.
- 5 WIDE/NARROW (Bandwidth LED Indicator)**
Pressing "BANDWIDTH" **12** causes WIDE or NARROW to light up alternately.
- 6 NR/NB (MPX NR/NB Indicator)**
This LED lights up when the NR/NB button **11** is pressed, and indicates that MPX NR in FM, NB (Noise Blanking) in AM is operating.
- 7 TEN KEYS (Ten Key Buttons)**
Used to specify numbers for Memory and Preset Call. Channels 1-30 can be specified using these buttons.
Preset Call Setting Method
A station that has already been preset can be fetched by the following method.
Pressing **1**, **2**, **ENTER** in order fetches the station present in memory for channel 12.
- 8 ENTER (Enter Button)**
Used for setting Memory, and Preset Call.
- 9 TUNING (Tuning Buttons)**
Used to change the received frequency to a higher frequency (UP) or a lower frequency (DOWN).
- 10 BAND (Band Button)**
Selects between FM or AM.
- 11 NR/NB (MPX NR/NB Button)**
Switches NR/NB "ON" or "OFF". Lights "ON" LED **6**.
ON: In FM, Suppresses noise when a stereo broadcast with weak signal is being received.
In AM, Suppresses impulse noise from cars, power lines and so on.
OFF: Does not carry out the above operation.
- 12 BANDWIDTH (Bandwidth Selector Button)**
Selects the IF bandwidth in FM, "WIDE" or "NARROW", and the audio bandwidth in AM. In AM "NARROW", Audiobandwidth is automatically controlled according to the strength of input signal. Weak signal makes the audiobandwidth narrow.
Bandwidth indicator **5** shows either state.
- 13 AUTO MUTE/MANU (Tuning Mode Button)**
This switches between auto and manual tuning.
Auto tuning: When the UP button is pressed, the radio is tuned automatically to a higher frequency. Press the DOWN button to tune to a lower frequency. Use this position to eliminate noise when no signals or weak signals are being received.
Manual tuning: In this position, the radio can be tuned manually.
- 14 MEMORY (Memory Button)**
Used to store the frequency of the station currently received.
Pressing **MEMORY**, **1**, **2**, **ENTER** in order stores the station on channel 12 in memory. Up to 30 channels of either FM or AM can be stored in memory.
- 15 SIGNAL (Signal-Strength Indicators)**
The number of LEDs that light increases in correspondence with the strength of the signal being picked up by the antenna.
- 16 MEMORY (Memory Indicator)**
This indicator lights when the MEMORY button **14** is pressed.
- 17 CHANNEL (Channel Indicator)**
This displays the number of the channel at which the station is stored.
- 18 DIGITAL FREQUENCY INDICATOR**
Reception frequencies are digitally indicated with numbers. The FM frequency unit is MHz; the AM (MW) frequency unit is kHz.
- 19 REMOTE SENSOR (Remote Control Photosensitive Window)**
This sensor receives the infrared light transmitted from the wireless remote control unit.
When operating the wireless remote control unit, point it towards this sensor.

OPERATION INSTRUCTIONS

PREPARATION

CHECKING CONNECTIONS

- Check all the connections by referring to connection diagram (Fig. 1).
- Check that the right (R) and left (L) channels of the speakers are connected to the corresponding right (R) and left (L) plugs, and check that polarities (positive and negative) are correctly matched.
- Check that the right (R) and left (L) pins are correctly inserted to the corresponding jacks.
- Check that all the cords are firmly connected.
* Turn on the power with the POWER switch after checking all the connections.

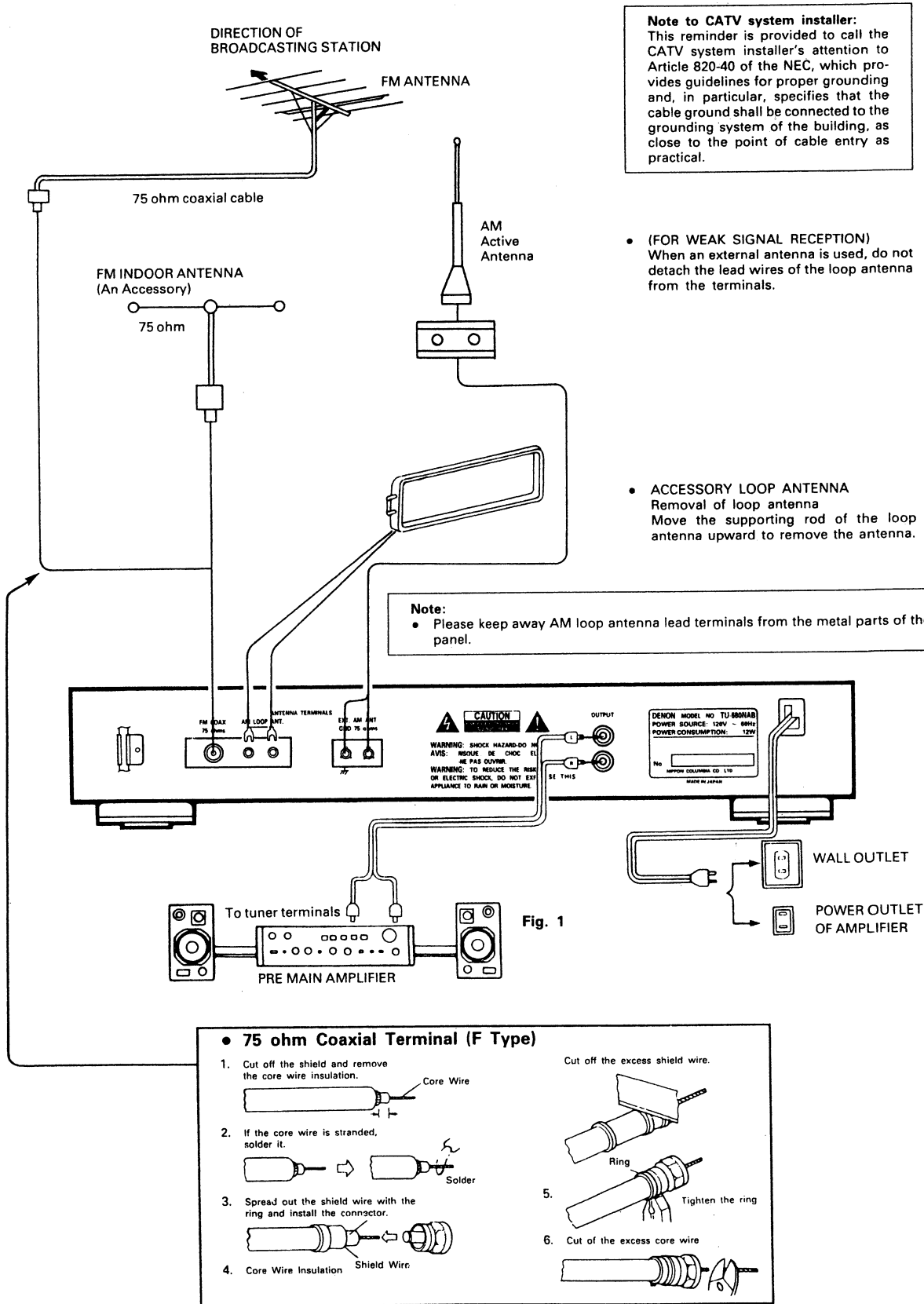
CHECKING ANTENNA

1. Do not incorrectly connect the loop antenna. If you are not sure how to connect the loop antenna, refer to Fig. 1.
2. Use of loop antenna: Keep the loop antenna away from the main body. If the antenna contacts a metal body, reception sensitivity is degraded, thus resulting in unclear reproduction.

Using the AM Noise Blanking System

The AM Noise Blanking (NB) circuit provided in this tuner uses digital technology which is very effective in eliminating the random pops and pulse noises caused by power lines, automobile ignitions, and certain weather conditions. However, under some conditions, the NB circuit may not be effective. This is not a defect.
When you select an AM station, listen to the broadcast with the NB switch On then Off. Leave the NB switch in the position that offers you the best results.

CONNECTIONS



Note to CATV system installer:
This reminder is provided to call the CATV system installer's attention to Article 820-40 of the NEC, which provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

• (FOR WEAK SIGNAL RECEPTION)
When an external antenna is used, do not detach the lead wires of the loop antenna from the terminals.

• ACCESSORY LOOP ANTENNA
Removal of loop antenna
Move the supporting rod of the loop antenna upward to remove the antenna.

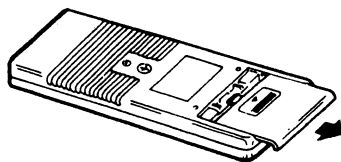
Note:
• Please keep away AM loop antenna lead terminals from the metal parts of the back panel.

REMOTE CONTROL UNIT

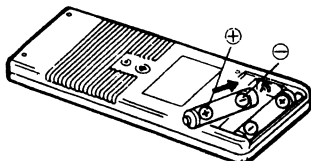
The accessory RC-126 remote control unit is used to control the tuner from a distance.

● Inserting the dry cell batteries

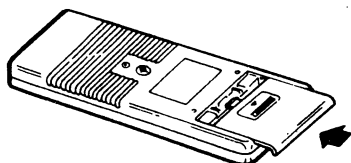
- 1 Remove the rear cover on the remote control unit.



- 2 Insert two size R03 ("AAA") dry cell batteries as shown in the diagram on the battery supply unit.



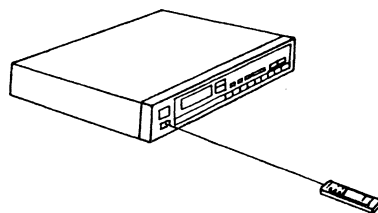
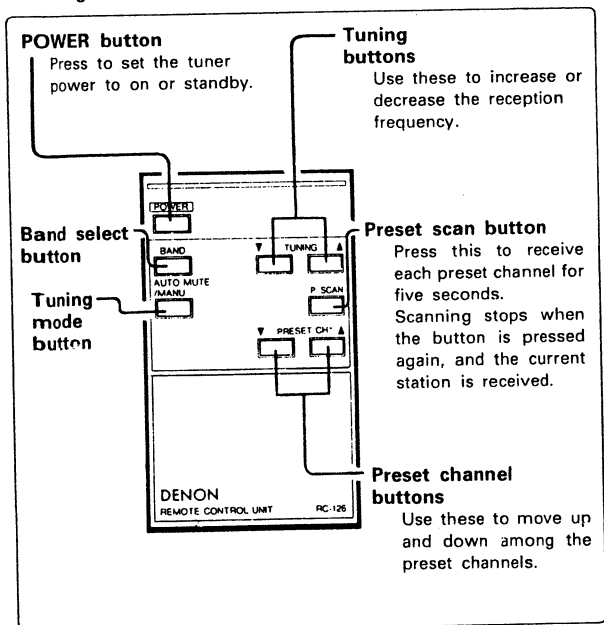
- 3 Replace the rear cover.



Notes on Use of the Batteries

- The remote control unit uses size R03 ("AAA") dry cell batteries.
- The batteries will need to be replaced approximately once a year. This will depend upon how often the remote control unit is used.
- If, in less than a year from the time new batteries were inserted, the remote control fails to operate this unit from a near-by position, it is time to replace the batteries.
- Insert the batteries properly, following the diagram on the remote control battery supply unit, and making sure to align the plus and minus sides of each battery.
- Batteries are prone to damage and leakage. Therefore:
 - Do not combine new batteries with used ones.
 - Do not combine different types of batteries.
 - Do not jumper the opposite poles of the batteries, expose them to heat or break them open, or put them into open fire.
- When the remote control unit is not to be used for a long period of time, remove the batteries from the unit.
- If the batteries have leaked, remove any battery fluid from the inside of the battery supply unit by wiping it out thoroughly, and insert new batteries.

● Using the remote control unit



- Set the POWER switch on the tuner to OFF (■) when not using for long periods of time.
- Point the remote control unit towards the remote control sensor on the tuner when pressing keys.
- The remote control unit can be used at a distance of about 8 meters directly in front of the tuner. The remote control unit uses infrared rays, so it will not work if there are obstacles between it and the tuner. Also, if used at an angle, the distance from which operation is possible will be shortened.
- Do not press keys on the tuner and the remote control unit simultaneously, as this may result in malfunction.
- The remote control unit may not function if intense light is shining on the tuner's remote control sensor.
- Do not operate two remote control units simultaneously, as this may result in malfunction.

ADVICE FOR USE

- Do not place the set in direct sunlight, in hot areas such as near heating equipment, with high humidity or dust levels. This may cause damage to the unit.
- Check that all parts are connected correctly before turning on the power source.
- When user is absent for long periods, be sure to remove plug from wall socket.
- Do not use insecticide, benzene or thinner near the unit, or the cabinet color will fade. Avoid using polish: use a soft cloth (e.g. silicon cloth).
- It is not recommended to place players, decks and other objects on the this appliance so that the ventilation openings are blocked.
This will cause internal temperature rise and equipment failure. Do not use this appliance in a closed cabinet or container. This will cause internal temperature rise abnormally.

SPECIFICATIONS

- **FM SECTION**
Frequency Range: 87.5 MHz ~ 108.0 MHz
Antenna Terminal: 75 ohm Unbalanced
Usable Sensitivity: 1.0 μ V (11.2 dBf)
S / N 50 dB Sensitivity: Monaural 1.6 μ V (15.3 dBf)
Stereo 20 μ V (37.2 dBf)
(μ V at 75 ohms, 0 dBf= 10^{-15} W)
Image Interference Ratio: 80 dB
IF Interference Ratio: 100 dB
AM Suppression Ratio: 60 dB
Effective Selectivity: NARROW 75 dB (\pm 400 kHz)
WIDE 50 dB (\pm 400 kHz)
Capture Ratio: 1.3 dB
Frequency Characteristics: 20 Hz ~ 15 kHz +0.5 dB, -1.0 dB
Signal-to-noise Ratio: Monaural 88 dB
Stereo 82 dB
Total Harmonic Distortion: Mono 1 kHz (at 75 kHz dev.) 0.06%
Stereo 1 kHz (at 67.5 kHz dev.) 0.1%
Stereo Separation 1 kHz: 50 dB
- **AM (MW) SECTION**
MEDIUM WAVE
Frequency Range: 520 kHz ~ 1710 kHz
Frequency characteristics 50 Hz ~ 7.5 kHz +1.5 -3.0 dB
(wide position, refer to NRSC)
Signal-to-noise Ratio: 53 dB (Monaural)
Stereo Separation: 32 dB (1 kHz, 50% modulation)
Total Harmonic Distortion: Mono 0.3% 1 kHz 50% modulation
Stereo 0.5% 1 kHz 50% modulation
- **OTHERS**
Power Supply: AC 120 V/60 Hz
Power Consumption: 12W
Dimensions: 434(17-3/32")(W) \times 74(2-29/32")(H) \times 287(11-19/64")(D)mm
Net Weight: 3.1 kg (6 lbs 13 oz)
- **REMOTE CONTROL UNIT** **RC-126**
Remote control system: Infrared pulse
Power Supply: DC 3V with two R03 (AAA) batteries
External dimensions: 58 (W) \times 125 (H) \times 19.5 (D) mm
Weight: 80 g (including batteries)

Design and Specifications are subject to change without prior notice.

DENON TU-680NAB "SUPERRADIO"

reduce impulse noise, manually or automatically selectable audio bandwidth, connections for an external AM antenna, and the capacity to pick up all stations on the newly expanded AM band (now 540 to 1,700 kHz). If stereo is included, an AMAX tuner must be able to decode the Motorola-developed C-QUAM system. According to Denon, the TU-680NAB is the first tuner to incorporate all of the AMAX requirements,



For some years now, I have bemoaned the fact that the AM circuitry in most "high-fidelity" tuners and receivers does not take advantage of the signal quality that AM stations are capable of transmitting. As readers of *Audio's* tuner reports know, AM frequency response typically rolls off at around 2.5 kHz or, in exceptional cases, at 4 or 5 kHz. Yet AM broadcasters can transmit signals whose response extends far beyond this limit.

To show how good AM could be, the National Association of Broadcasters (NAB) commissioned a "SuperRadio" tuner from Denon, originally made for NAB members but now available to audio enthusiasts. The project resulted from the improved AM broadcasting and reception standards developed by the National Radio

Standards Committee (a joint effort of the Electronic Industries Association and the NAB). The NAB has also set up a certification standard, called AMAX (AM at its maximum) for high-fidelity tuners. To get

**THE DENON TU-680NAB
IS BOTH A BYPRODUCT
AND A JUSTIFICATION OF
TODAY'S IMPROVED AM
BROADCAST STANDARDS.**

AMAX certification, a tuner must have frequency response from at least 50 Hz to 7.5 kHz, with correct NRSC de-emphasis; it must also have automatic noise blanking to

and the NAB is offering it directly to its member stations.

Both the FM and AM sections of the TU-680NAB have selectable bandwidth but not in quite the same way. The FM section has selectable wide or narrow *i.f.* bandwidth, with the narrow setting used for increased selectivity in areas where stations are closely spaced on the dial. The AM section has selectable *audio* bandwidth; the "Wide" setting has a rated bandwidth of 7.5 kHz, while the "Narrow" setting varies automatically with signal strength, narrowing as far as 3 kHz when conditions call for it. The AM section also incorporates a noise-blanking circuit that significantly reduces interference from such sources as fluorescent lights and electric motors. According to Denon, this circuit detects and suppresses impulse spikes, filling in with a portion

of the preceding signal. The button that actuates noise blanking in AM mode also switches in the multiplex filter for FM. Confusingly, Denon has labelled this button "NR/NB," implying that the multiplex filter is some sort of noise reducer; actually, the only connection to "NR" is that the filter enables a tape deck's Dolby noise-reduction circuits to work properly when taping a signal from this tuner.

Up to 30 channels of either AM or FM can be stored in memory for instant recall. A remote control, capable of handling vir-

tually all the tuner's functions, is supplied. The remote control also has a "Preset Scan" button that is not found on the tun-

A NOISE-BLANKING CIRCUIT SIGNIFICANTLY REDUCES AM ELECTRICAL INTERFERENCE.

er's front panel. Supplied accessories include the usual stereo interconnect cable, FM ribbon antenna, and snap-on AM loop antenna. Separate connections are provided for an external AM antenna, so the loop need not be disconnected when an outdoor antenna is used. (According to Denon, disconnecting the loop antenna from this or most other AM tuners will change the resonance of some front-end circuits, preventing proper operation even when an external antenna is substituted for the loop.) The tuner's AM frequency band extends from 520 to 1,710 kHz, covering the expansion of the AM band recently authorized by the FCC.

Control Layout

The "Power" switch and remote-control sensor are at the far left of the panel. Just to their right is a display that shows the current tuning frequency, preset number, radio band, tuning mode ("Auto" or "Manual"), reception mode ("Mono" or "Stereo"), and which of the mixed AM/FM preset banks is in use. The display also shows the presence of a signal, even if it's too weak to be indicated by the signal-strength section of the small secondary display further to the right. This secondary display also indicates the current bandwidth and if the noise blanker and multiplex filter are on.

The right half of the panel is dedicated to pushbuttons, including "Memory" for storing station frequencies and others for auto/manual tuning, "Bandwidth," "NR/NB," AM/FM "Band" selection, and "Tuning (Down/Up)." Below this row are 10 num-

bered buttons and an "Enter" button, used in entering and recalling preset stations.

The rear panel of the TU-680NAB is equipped with a bracket for the AM loop antenna. Terminals are provided for this AM antenna and for an external or outdoor antenna, as is an F-connector for a 75-ohm coaxial FM antenna lead and the usual left and right phono jacks for audio output.

Although Denon and the NAB emphasize the AM performance of this component, I was equally interested in finding out just how good its FM circuitry is. After all,

SPECS

FM Section

Usable Sensitivity: 11.3 dBf.

50-dB Quieting Sensitivity: Mono, 15.3 dBf; stereo, 37.2 dBf.

Frequency Response: 20 Hz to 15 kHz, +0.5, -1 dB.

S/N: Mono, 88 dB; stereo, 82 dB.

THD at 1 kHz: Mono, 0.06%; stereo, 0.1%.

Capture Ratio: 1.3 dB.

Image Rejection: 80 dB.

I.f. Rejection: 100 dB.

Alternate-Channel Selectivity:

Wide, 50 dB; narrow, 75 dB.

Separation: 50 dB at 1 kHz.

AM Suppression: 60 dB.

AM Section

Frequency Response: 50 Hz to 7.5 kHz, +1.5, -3 dB.

Channel Separation: 32 dB at 1 kHz, 50% modulation.

THD for 50% Modulation at 1 kHz:

Mono, 0.3%; stereo 0.5%.

S/N: Mono, 53 dB.

General Specifications

Power Requirements: 120 V, 60 Hz a.c., 12 watts.

Dimensions: 17 $\frac{1}{16}$ in. W \times 2 $\frac{15}{16}$ in. H \times 11 $\frac{1}{16}$ in. D (43.4 cm \times 7.4 cm \times 28.7 cm).

Weight: 6.8 lbs. (3.1 kg).

Price: \$650.

Company Address: 222 New Rd., Parsippany, N.J. 07054.

For literature, circle No. 92

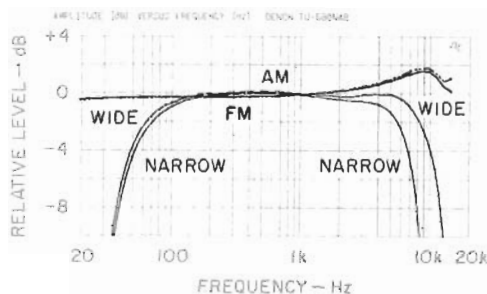


Fig. 1—Frequency response.

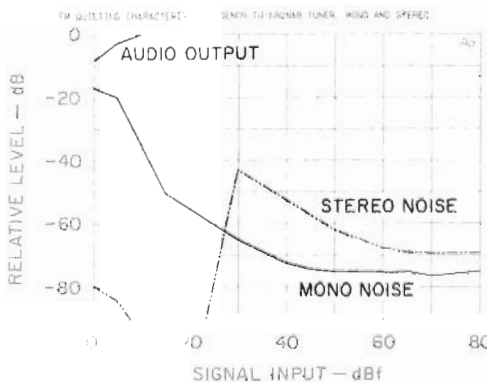


Fig. 2—FM quieting characteristics; see text.

to be dubbed a "SuperRadio" implies that its performance is super in all respects. Accordingly, I tested FM performance before tackling the AM section.

FM Measurements

Figure 1 shows frequency response. Despite a rise of almost 2 dB at 10 kHz, overall

FM response extends out to 15 kHz. We'll get to AM performance later, but note how well the AM section's frequency response, superimposed for comparison, stands up to that of the FM section.

Figure 2 shows FM quieting characteristics for both mono and stereo, as a function of incoming signal strength. In mono, 50-dB quieting is achieved with input signals of only 15.3 dBf, exactly as claimed by Denon. To measure this, I had to press the

"Auto Mute/Manu" button, which controls muting, automatic or manual tuning, and mono switching. Stereo reception is only possible when this button is set to "Auto Mute." Stereo muting occurs somewhere below 30 dBf, by which time S/N is already well above 40 dB. This is typical of sets that combine the muting and mono/stereo switching functions in a single control; such sets can only receive stereo signals whose signal strength exceeds the muting threshold. In the TU-680NAB, this threshold has been set at just about the right level.

Figure 3 is a plot of THD + N versus modulating frequency. In mono, THD + N at 1 kHz is a very low 0.057%, increasing to 0.085% at 100 Hz and a bit over 0.1% at 6 kHz. For stereo reception, THD + N measures just over 0.1% at mid-frequencies, increasing to 0.17% at 100 Hz and to 0.16% at 6 kHz. Figure 4 shows how distortion of a 1-kHz modulating signal varies with signal strength. For a 65-dBf signal, THD + N is 0.07% in mono and 0.08% in stereo.

Figure 5 shows frequency response and channel separation for FM, with the AM section's response and separation overlaid for comparison. In the FM mode, separation is excellent, reaching nearly 50 dB at 1 kHz and maintaining that level at 100 Hz. At 10 kHz, the separation remains greater than 30 dB.

A further test of stereo FM performance involved a spectrum analysis of the modulated (left-channel) and unmodulated (right-channel) outputs of the tuner for a 5 kHz left-only signal modulating my FM signal generator (Fig. 6). The top curve shows the reference output level of the 5-kHz signal (peaking at 0 dB) as well as harmonic components at 10 and 15 kHz and at 5-kHz intervals out to the end of the sweep. Even the greatest of these harmonic components (that at 10 kHz) is down about 70 dB below reference level, equivalent to a second-harmonic distortion level of only 0.03%.

Note, too, that the 19-kHz pilot carrier has been suppressed by 80 dB, while the sidebands of the suppressed 38-kHz subcarrier, at 33 and 43 kHz, are attenuated by almost 60 and 65 dB, respectively. As for the output of the unmodulated channel, 5-kHz crosstalk is down some 40 dB relative to the

EVEN IN NARROW-BAND MODE, THE AM SECTION'S FIDELITY WAS BETTER THAN I'VE HEARD FROM AM IN MANY YEARS.

reference level. Other harmonic components and subcarrier components are also adequately attenuated.

Alternate-channel selectivity measured 60 dB in the wideband mode, increasing to 77 dB when the narrow mode was selected. Image rejection exceeded the published spec; it was 85 dB, as against 80 dB claimed. AM suppression was exactly 60 dB, as claimed, while capture ratio measured 1.2 dB. I.f. rejection was in excess of the 100 dB claimed.

AM Measurements

What a pleasure it was to finally come across a tuner whose frequency response in AM extends well beyond 5 kHz. In fact, as was shown in Fig. 1, response in the wideband AM mode extends way out to 9.2 kHz before the attenuation reaches 3 dB! (In other tuner reports, I usually use a more permissive 6-dB criterion for AM frequency response.) Even when I used the narrow mode, frequency response of this remarkable AM section extended beyond 6 kHz for a 10-mV signal. At the bass end of the spectrum, the -3 dB point was reached at approximately 50 Hz.

Figure 7 shows how THD + N varies with frequency for the AM section, with modulation levels of 90%. At 1 kHz, the THD + N measures 1.2% in the wide mode and increases slightly, to 1.4%, in the narrow mode. Note that the published specs for AM distortion were given for 50% modulation. At that modulation level, the claimed THD figures of 0.3% in mono and 0.5% in stereo were met or surpassed.

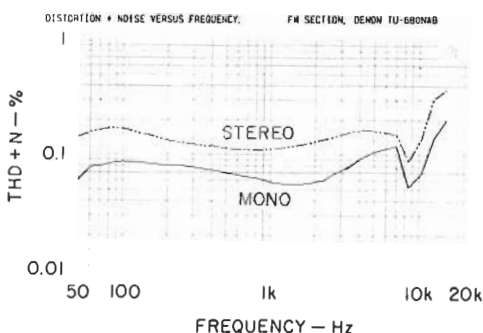


Fig. 3—THD + N vs. FM modulating frequency.

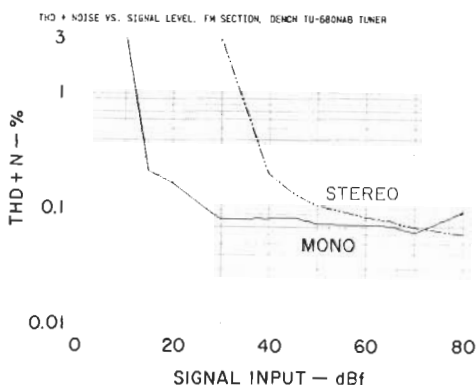


Fig. 4—THD + N vs. FM signal strength.

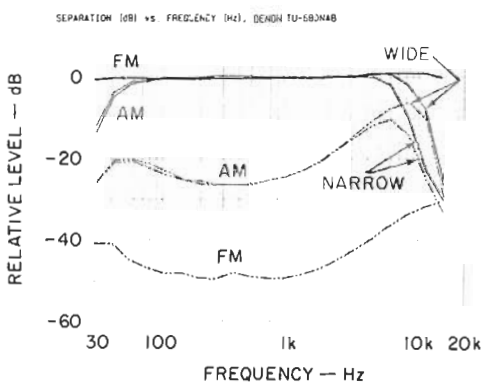


Fig. 5—Frequency response and channel separation.

Harmonic distortion itself, without the noise component, was just under 1%, as measured by spectrum analysis of a 1-kHz

**TO MY EARS AND OTHERS',
THE AM ACTUALLY
SOUNDED BETTER THAN
AN FM SIMULCAST!**

signal at 90% modulation. Ultimate S/N, with strong signals applied, was 55 dB for monaural operations, as against 53 dB claimed.

As shown in Fig. 5, channel separation in AM is just over 24 dB at 1 kHz, regardless of the audio bandwidth setting, and it is more than adequate. At 100 Hz, separation is approximately 23 dB for either bandwidth setting. At 6 kHz, it decreases to just over 8 dB for either mode at the 10-mV r.f. signal level I use.

Use and Listening Tests

I hooked up an ordinary indoor dipole antenna to the FM antenna terminal and oriented the dipole towards the west, in the direction of most of the transmitter antennas in my metropolitan area. Under these conditions, I was able to receive no fewer than 53 acceptable signals in mono, nearly a half dozen more than I've usually gotten with typical "hi-fi" tuners and receivers I have tested in the last several years. Switching to the automatic tuning mode (thereby activating stereo circuitry), I logged some 43 acceptably noise-free stereo signals on the FM band.

Orienting the supplied AM loopstick for best reception, I then switched to the AM band and logged 26 acceptable signals. There was little difference in the signal count when I switched from automatic to manual tuning mode. A few of the stations exhibited less interference when I switched to the narrow-band mode, but even then, audio fidelity was better than I have heard from an AM tuner in many years. (Back in

the 1940s and 1950s, AM receivers—then in the majority—sounded a lot better than most AM tuner sections do today. The Denon TU-680NAB is a happy exception to this unhappy trend.) Perhaps the most startling revelation occurred when I tuned to a classical music station on the FM band that also simulcasts on AM. This enabled me to switch back and forth between them while listening to the same program. I know you may find this hard to believe, but to my ears (and to those of several visitors

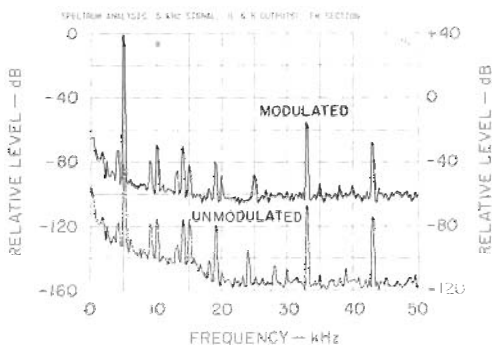


Fig. 6—Spectrum analysis, showing FM stereo crosstalk and distortion products. Use right-hand scale for bottom curve.

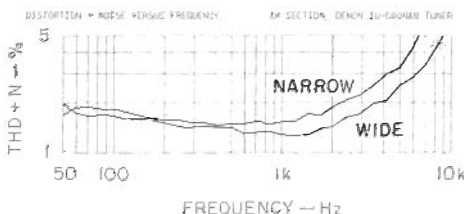


Fig. 7—THD + N vs. AM modulating frequency, with monophonic input signals.

in my lab when these tests were going on), the audio quality of the AM transmission actually seemed better than that of the FM band!

Denon deserves to be congratulated for its effort. The TU-680NAB "SuperRadio" may very well inspire other equipment manufacturers to follow a similar course in designing tuners and receivers.

Leonard Feldman